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It's Got Everything but the Money

The '89 R&D Budget: Big and Chock Full of Mega-Projects

Science that lives off of Washington routinely endures money problems. But these have usually involved amounts so minor in the context of the total federal budget that researchers could plausibly complain about political myopia and then anguish over the big difference that a small increase could make. Now, however, there's something new in the economics of science: A lineup of "big science" proposals that would require many billions beyond current spending. But, as the federal budget remains trussed up by Gramm-Rudman, the huge additional sums needed to finance all these aspirations are nowhere in sight.

One result is a rare outbreak of scientific squabbling about how to use the available funds. Erich Bloch, the Director of the National Science Foundation, recently accused the Pentagon of "getting a free ride" by using science while providing it with little support (SGR Feb. 15, 1988). "Little" grantees are fearful that NSF's growing support for big research centers will come out of their accounts—which is why NSF, disappointed in its last budget quest, has reluctantly delayed the launch of a new centers program. Meanwhile, there's been a breakdown in the collusive tolerance that normally keeps peace between and within disciplines. Nasty words are being exchanged on the wisdom of spending $4.2 billion on the Superconducting Super Collider (SSC) and the "little" life scientists are taking pot shots at plans for the multi-billion dollar genome project.

The money problems originate in past successes that point the way to even greater ones—if billions of dollars are spent on new equipment and programs. The opportunities range from outer space to the innards of the atom, the human cell, and the depths of the earth. With realism and hype, the new world of discovery is depicted

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Praise, Criticism for OSTP—P. 8
Change in Super Collider Timetable—P. 6

Reagan's R&D Swan Song

Following are the big round numbers, in millions, for R&D obligations in the budget proposed by the Administration for fiscal 1989:

Agency	1989	1988	1987	% change '88-'89
DOD	$38,787	$37,899	$36,088	2
HHS	7,938	7,174	6,643	7
(NIH)	7,122	6,666	6,186	7
NASA	5,416	4,779	3,787	13
Energy	5,165	5,071	4,724	2
NSF	1,827	1,524	1,464	20
Agriculture	985	1,018	946	-3
Interior	396	419	403	-5
EPA	374	350	348	7
Transport.	317	325	322	-2
Commerce	312	408	405	-24
All other	1,000	984	960	2
Total	62,517	59,951	56,090	4

In Brief

Science and engineering jobs rose from 2.6 to 4.2 percent of the American work force between 1976 and 1986—and their annual growth rate, 7 percent, was over three times the general increase in employment, according to a new report from NSF. But the ranks are rapidly graying: 44 percent of the scientists were over 40 in 1986, compared to 36 percent a decade before; in the same period, the over-40s in engineering rose from 47 to 59 percent. The report, NSF 87-313, is available without charge: NSF, Division of Science Resources Studies, 1800 G St. NW, Washington, DC 20550; tel. 202/634-4634.

Reversing a seven-year habit that always came to naught on Capitol Hill, the Administration is recommending an increase—rather than deep cuts—in the NIH budget, from $6.7 billion to $7.1 billion (including funds for AIDS.) But the biomedical research lobby, now gearing up for appropriations hearings, says the boost won't meet its goal of full funding for 50 percent of all approved applications. Speculating on the budgetary turnabout, one biomednik said, "In the last year, they want to make beautiful music on everything from arms control to medical research."

Stanford University, one of the hardest driving schools in seeking financial profits from its lab work, reports that it took in $6,051,125 in 1986-87 from royalties on patents by staff members. That's a record amount for Stanford and maybe for all of academe, the university says.

Not yet announced, but SGR hears that George A. Keyworth II, a Washington consultant since resigning as Reagan's Science Adviser in 1985, will soon be off to a new job: Director of research for the Hudson Institute, the policy-research outfit founded by the late Herman Kahn, and now located in Indianapolis.

. . . 13 Percent Increase Proposed for University Research

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by its proponents as essential for industrial competitiveness, improved defenses, cures for dreadful diseases, new understandings of natural phenomena, and cultural enrichment. In a special review, *Science and the Budget,* the Congressional Research Service states that today's situation in R&D finance "may be unprecedented because of the number and costs of projects now on the table" (see P. 4).

In the great tradition of aerospace accountancy, the manned space station has been hatched with cost estimates so elastic as to be meaningless, but its construction will be cheap at $25 billion. The SSC comes with operating costs of $270 million a year. The quest for clean nuclear power through fusion is limping along on a sharply reduced budget of $335 million a year, and pleading for more. Gene researchers, camouflaged as a disinterested committee of the National Academy of Sciences, have just asked for $200 million a year for 15 years to "map" the entire human gene structure. (Their brief, *Report of the Committee on Mapping and Sequencing the Human Genome,* will be published by NAS in April.)

Meanwhile, universities estimate that after years of federal neglect, they need $10 billion to $20 billion for updated research facilities; they point to last year's super crop of pork-barrel appropriations as evidence of the need. NSF is living with so-far-disappointed hopes of a step-by-step doubling of its budget, to over $3 billion, by 1992. Research on the looming crises of the environment, such as the greenhouse effect, acid rain, and ozone loss, is skimping on $800 million a year—with a long list of important work going undone. AIDS research, negligible just three years ago, is pointed toward $1 billion a year. And so on into a flock of other costly items, among them the Strategic Defense Initiative and the "Orient Express" hypersonic aircraft.

The paradox of finance for science is that proposed federal spending for research and development is at an all-time peak, $67 billion. In its farewell budget, for fiscal 1989, the Reagan Administration was relatively kind to R&D. Overall, it is budgeted to increase by 4 percent, but within the ups and downs of that amount, R&D at universities is budgeted for a 13 percent rise. The official rhetoric in behalf of science is outstanding, with the President leading the way in depicting research as the nation's economic savior.

The President's budget calls for an additional $303 million for the NSF, $363 million for startup construction of the SSC, $740 million for the space station, and money for various other items of research. But these

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"Voodoo R&D Budgeting"

From the opening statement by Chairman Robert Roe (D-NJ), February 23, at the annual hearing on the President's R&D budget before the House Science, Space, and Technology Committee, at which the President's Science Adviser, William R. Graham, was the sole witness.

•

I must call to your attention that the figures simply do not add up. Under the summit budget agreement [last fall, between the Congress and the White House], domestic discretionary spending is to increase in fiscal 1989 no more than $3 billion—from $145.1 billion to $148.1 billion. Yet we have before us a series of R&D budget increases which, for three agencies alone, add up to well over $3 billion: $2.5 billion for NASA, $400 million for the Department of Energy, and $300 million for NSF, for a total of $3.2 billion.

Such sums can be provided only if the Congress not only agrees with the proposed priorities and reductions for domestic discretionary spending but makes further reductions in those programs. It assumes that such proposed [by the Administration] reductions as the elimination of the Economic Development Administration, the cuts in the Agricultural Commodity Price supports, the elimination of Urban Mass Transit Grants, the privatization of Waste Treatment Plant Construction, and the cuts in the Food Stamp program will be accepted.

In a Presidential election year, neither Democrats nor Republicans in the Congress are likely to go along with anything of the kind. We therefore have a federal budget proposal for research and development which, to borrow a phrase from the Iowa caucuses four years ago, can at best be called an exercise in Voodoo R&D budgeting.

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. . . Defense Spending Reductions Eyed by Many Contenders

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proposed increases are mainly small downpayments on programs that would burgeon in later years. Furthermore, they are conspicuous standouts in a budget that has long provided lean treatment for domestic social programs.

In looking about for finance for science's great wish list, it's noteworthy that less than 30 percent of the federal government's R&D money goes to civilian agencies, homebase for most of the hoped-for projects. The bulk of it goes to the Pentagon, which is heavily into developing weapons systems and only peripherally involved with basic scientific research.

An obvious hope is that a shift from military to civilian concerns would help federal civilian agencies finance the next generation of scientific wonders. But don't count on that. A shift from defense to civilian research makes scientific and economic sense. But it's likely only as part of a broad shift in national priorities—and many other needy claimants are eyeing that Pentagon money.

Science now consumes 16 percent of all non-defense "controllable" spending. Any attempt to raise that share will produce collisions with interest groups far more powerful than the research community. Last year, a major attempt to raise NSF's share of the budget lost out to federal housing subsidies and veterans' medical care.

What's the connection? None at all, except that the peculiarities of Congressional jurisdiction put NSF under the same appropriations subcommittees as the Veterans Administration, NASA, and the Department of Housing and Urban Development. The subcommittees, one in each chamber, are allotted a given sum to divide among their responsibilities, and when one agency gets more, another necessarily gets less. The big increase that NSF was hoping for last year was coming along on schedule when the October stockmarket crash panicked Congress into a deficit-cutting orgy. Subcommittees were thus forced to reduce their appropriations recommendations, and, in doing so, the influential House subcommittee leaned away from NSF in favor of its other charges.

Collaboration with other countries can spread the costs of big science. But America's industrial rivals are not eager to help us out of our budget pickle—especially when the White House proclaims that science is a major weapon in economic competition.

Throughout their post-World War II partnership, politics has usually been hospitable to science's major aspirations, from the war on cancer to the $1 billion space telescope. Disappointments have occurred, but they arose from particular circumstances, such as a grumpy appropriations chairman or a misguided cost estimate that upset budget planning. The latter happened when Shuttle overruns virtually destroyed NASA's planetary science program.

The difference now is that the wish list has never been greater and the budget prospects have never been gloomier. Science is overflowing with bright ideas, but not among them is a politically feasible design to get the money. Then do without? The ideology of science deems that prospect unthinkable. Research, it insists, must go where it can go. And, as far as the managers of science have been concerned, the discussion ends there. When confronted by not enough money to do everything, they have usually taken refuge in the "stretch out"—which means that everything gets something and maintenance is deferred, even to the point of decrepitude in facilities.

NSF Director Bloch has departed from this tradition by asserting that "we should understand that trying to do everything is to accomplish nothing—and that priority setting is part of our responsibility" (SGR Feb. 15). But, in its soul, the scientific establishment regards that assessment as a defeatist concession to political ignorance. The Congressional Research Service study observes, "Traditionally, the organized scientific community has advised Congress on priorities *within* scientific fields, but it has generally been unable and unwilling to offer guidance on priorities *among* (original italics) fields."

Regarding the White House Office of Science and Technology Policy, the CRS gingerly states that "some observers say that the OSTP has focused its energies on budgets for selected R&D programs and initiatives and that it has not played a major role in the general formulation of R&D budgets in recent years." In Congress, the CRS study points out, the scattering of R&D authority among many committees precludes priority making or even a general design in federal support.

So far, the scientific enterprise has muddled through on big budgets and good luck. But that was before the use of largescale technology spread from a few fields of science to virtually all of them. Today, big science is the rule rather than the exception. The basic fact of contemporary scientific finance is that the money is not there for all the grand ventures brewing in the high councils of research. And it's not likely to come out of a political system obsessed with deficit cutting and uneasily aware of a great backlog of socially volatile, long-neglected domestic needs.

It's easy to talk about priorities. What's needed now is for somebody, or some group, to propose them, or at least suggest a method for choosing among all the many wonderful projects on the scientific agenda.—DSG

How Do We Set Science Priorities? House Committee Asks

The politics of research finance has settled into a paradox in which proponents of big spending now predominate in Congress and the White House, but almost all involved gloomily doubt there's a way to wrest the proposed growth from the increasingly constricted federal budget. As a result, Congressmen are demanding that the managers of science declare priorities, a hateful task that science has rigorously avoided.

The demand was repeatedly stated and resisted last week when the House Committee on Science, Space, and Technology (SS&T) held its annual "posture" hearing on the research and development segments of the newly proposed federal budget. Written for fiscal 1989, which begins next October 1, the budget is seven election-season months away from startup, which means that its relationship to reality is dubious. Nonetheless, the Congressional agenda dictates that committees pore over the document.

As is the custom, the only witness at the SS&T hearing was the President's Science Adviser, William R. Graham, who was warmly, even effusively, greeted by Chairman Robert Roe (D-NJ). Graham is widely regarded in Washington science-policy circles as the least-qualified appointee in the long history of Presidential science advice. But with the Science Office sharply reduced in staff and languishing in the Reagan White House, the advocates of a strong science-advisory setup are not disposed to compound the difficulties by badgering Graham.

"You have worked diligently and you have a splendid background," Roe said to Graham at the outset of the hearing. Other members of the Committee added their compliments, and then Graham, after expressing what appeared to be heartfelt thanks for kind words, at last, described and praised the President's R&D spending proposals.

Roe held his response until several other members had taken turns commenting on the budget and questioning Graham. But then, the Chairman let loose. Asking a Committee member who was questioning Graham to yield his turn, Roe went into an emotional soliloquy, describing the Administration's R&D plans as "hollow statements" and "pie in the sky." Then he directly addressed Graham:

"Let me say at the outset, I wish that you were calling the shots here, because we would take that budget and run like mad. We think you, as the Science Adviser, are right on target. However, the realities of it are really pretty slim," Roe said.

Continuing, the Chairman observed, "On balance, you have come up with a good program. But now we have a point where we know that is not going to be allocated. There's no sense in wasting time in kidding each other as far as the funding is concerned. Having said that," Roe asked, "which would you cut out? There's a great feeling on this Committee and in the Congress that maybe we shouldn't do a Super Collider. There's a feeling of some members, not necessarily on this Committee, but in Congress, we shouldn't do the Space Station."

Roe demanded: "What priorities would you set? Would you drop the Super Collider? Would you provide a little funding here, a little funding there, to keep it alive?" And the Chairman added, "If you were king, what would you cut? Well, you are; you're the Science Adviser. What would you do? What would you recom-

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A New Study of "Big Science"

An excellent rundown on the perplexing issues of finance for so-called big and little science is contained in a Congressional periodical that's virtually unknown off Capitol Hill. The publication is the Congressional Research Service (CRS) *Review*, a 10-times-a-year magazine that summarizes reports that CRS produces for the Congress.

The CRS is part of the Library of Congress, and among its various components is the Science Policy Research Division, which produced the articles, under the collective title "Science and the Budget," for the February issue of the *Review*. The *Review* articles would fit well on a reading list for science and public policy courses and also would be of interest to researchers seeking to keep abreast of R&D policy-making in Washington.

The articles describe the costs and claims for big and little science, the role of international cooperation in building and running big facilities, and the position of R&D in the federal budget processs. In addition, summaries are provided of recent CRS papers on the space station, the Superconducting Super Collider, fusion, humane genome sequencing, the International Geosphere-Biosphere Program, and university research facilities.

The CRS *Review* is sold by the US Government Printing Office: (GPO Stock No. 73-009-00000-3, $9.50 per year, $1.50 per issue, USGPO, Superintendent of Documents, Washington, DC 20402; tel. 202/783-3238.)

The full texts of the reports summarized in the *Review* are supplied only to Congressional members and staff. But they are free to pass them along to outsiders, and usually respond to a request.

. . . Roe Warns that R&D Can't Expect All the Budget Growth

(Continued from page 4)

mend to the Committee . . . when we say, 'Gee, we can't do that. We got only $1 billion . . . . Would you drop the Collider, would you drop the space station?' This is a terrible question," Roe said, "but that's where we're at and you might as well have it up front."

In reply, Graham said he hoped that the proposed budget would not "be viewed as dead on arrival on the Hill." The budget reflects increases in some programs and decreases in others. "I hope we'll be able to work together," Graham continued, to eliminate programs "that are ineffective, inefficient, duplicative, or low priority. That's where we have proposed to [reduce] funding and to balance that against the increased funding in science and technology, and I hope we'll be able to work together to show those areas where we'd like to find funds. Part of those come from an overall absolute increase in the total federal budget—to allocate those to the highest priority areas; these are largely in the science and technology area."

Graham attempted to continue, but Chairman Roe burst in: "You really don't believe that all of the other 435 members [of the House] are going to stand still on every other committee and say, We'll give the whole $3 billion [the increase from fiscal 1988 to 1989 agreed to at last year's budget "summit"] to science, space, and technology? You can't believe that, can you?"

Graham: "As I said, the entire budget has a very modest increase in it. But if we can find those accounts that we can get an agreement [on for reductions], we'll stand up at bat for them."

Roe: "But the reality of 16 other committees standing still and saying, 'Yes, we're going to accept that'—it's just not going to happen. Therefore, we're going to have to deal with the issue of what are the priorities going to be."

Noting that the SS&T Committee plans to hold hearings on the making of scientific priorities—date not yet set—Roe told Graham that "hopefully, we'll call you back . . . and say, 'If this is all we're allocated, and if we're looking for a dynamic science, space, and technology program, where would you allocate the funds?' "

Graham replied that the budget reflected a priority-making process within the Administration. Referring to NSF's decision to delay the start of its Science and Technology Centers program for one year to accommodate unexpected reductions in the current budget (SGR Feb. 1, 1988), he said, "We didn't want to cut into the size of the research grants, individual researchers' programs." That decision, he insisted, was an example of priority making.

Roe brushed that aside: "Are we going to say to the people of the country that we've cut $200 million out of the Food Stamp program because we want to do further research? That's going to be extremely difficult, even for the White House."

Graham answered that "our real goal is to get people off the Food Stamp program."

The priorities issue was pounded at length by Rep. Don Ritter (R-Pa.), who derives notice in the R&D area as the only science PhD in the Congress. (He was formerly a Professor of Metallurgy at Lehigh University). The proposed R&D budget for the Department of Energy, Ritter said, calls for "more than halving the fossil energy R&D program to build a demonstration clean-coal technology program. Conservation is cut in half. The big winner in the R&D is the SSC." Referring to the Administration's proposed budget increase for NSF, Ritter said, "I think it's somewhat a fantasy to ask for 19 percent. We all know what happens. Last year, we asked for 17 percent; we got 5. I am very concerned that physics, chemistry, the materials division, are below the 1988 request. So, we're going to have a gigantic clean-coal demonstration project, but we cut coal R&D in half. The underpinnings to this demonstration project are removed.

"We've had experience with mass scale demonstration projects that don't have a firm base in the science and the research," Ritter continued, "and we've been disappointed with some of the results, as you well know. We have a massive new commitment to NASA: the Shuttle and Space Station.

"I mean, honest to God," Ritter implored, "where is it all coming from?" Before Graham could reply, Ritter interjected, "If we go ahead with some of these big ones, the numbers just don't look good for the small programs. Here we're talking about superconductivity and yet, the materials budget at NSF . . . is going to be flat . . . . I'm really concerned at what's happening with this budget, and I think the White House should be very concerned, too."

Graham, now well into his second hour in the witness chair, cautiously replied: "It certainly is a serious issue of science policy that you've described. It's one in which we've laid down our priorities very clearly, with numbers attached to each one of them." Responding to Ritter's allegations about NSF's materials-research budget, Graham said that the Congressman had failed "to take into account the fact that it's more than possible that both Engineering Research Centers and Science and Technology Centers could be established to support interdisciplinary work in high-temperature superconductivity and related subjects."

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. . . Graham Says System Works Well for Making Priorities

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Ritter countered, "We could really get into a game of robbing Peter to pay Paul," adding, "I have a problem seeing how these priorities are set, where they are set." He then noted that he had been soliciting opinions on the SSC from members of the Industrial Research Institute "and I got to tell you that the response on the Superconducting Super Collider is just overwhelmingly negative . . . . "

"Where do we set priorities in our federal science policy?" Ritter asked. "Where does it come from? And how does it relate to this budget? I think we're dealing with the future of the country here," Ritter concluded.

Graham assured Ritter that "one thing we don't use in setting priorities is a czar. There are some philosophies that say that one person in the government should be the only source of information and guidance in these processes. In fact, what we have is very much of a cabinet-style government which draws on the individual agencies. We hammer and tong these programs in the forge of debate."

Ritter jumped in with: "You've authorized for the SSC, for the first year of a multi-year 10-year-funding stream, only *one* year. How do we do this?" he asked with exasperation. "Is NASA first, is clean coal second, is SSC third? . . . . Where is the Administration coming down with these mega-projects, where are we coming down on what our priorities are?"

Graham replied, "We couldn't say that this is number one, don't touch it . . . . That's not the way the process is done. Each one of these things is played against the other, first by the individual agencies, then between OMB [Office of Management and Budget] and OSTP [Office of Science and Technology Policy]. In some cases, major programs like the SSC and the Space Station . . . are forwarded to the President for a final decision."

Graham downplayed Ritter's SSC polling at the Industrial Research Institute, suggesting that many industrial firms would regard the SSC as "not our line of work, that's not very important to us." But, Graham continued, "if we had taken that view in the long run, I would argue, Mr. Ritter, that there would be no jet engines, no nuclear power, there would be very little of modern biotechnology, no pharmaceuticals, because in general, the basic research has led the industrial support, not followed it."

Ritter replied: "It's not basic research. It's where do we put the basic research, and should it be in biotechnology, photonics, superconductivity, manufacturing sciences, materials, or should it be in one of these mega-projects. The money is not there" for everything in the Administration's R&D budget, Ritter said. He concluded by quoting Philip Anderson, the Nobel laureate Princeton physicist, who recently denounced the SSC in a *New York Times* op-ed article: "American science is dying of giantism."

Graham didn't let that go by unanswered: "First, the science budget is not a conserved quantity under the budget summit agreement. It's part of the overall federal budget, which is only specified by three areas: domestic, international, and defense. And so we can play off against other accounts . . . . Second, if Professor Anderson had submitted his editorial to the same kind of merit review among people familiar with those figures that I'm sure he submits his technical papers to, I'm sure the editorial would have come out quite different."

The hearing ran for two and a half hours—unusually long for a proceeding of its kind. It didn't dislodge Graham from his insistence that all is well in this best of all possible systems for making R&D spending policy. It did leave many members of the SS&T Committee more concerned than ever about federal R&D planning. But they recognize that their ability to do much about it is limited. The SS&T Committee writes the laws but not the checks for NASA, NSF, DOE's basic research, plus a few other items. It thus has substantial power to illuminate specific issues, but very little power to control them.

The forthcoming hearings on R&D priorities are intended to rouse the rest of the Congress. That is a difficult task in any season, but especially so amid the distractions of election year and with the inflexibilities that have been deliberately built into the budget process by Gramm-Rudman.—DSG

DOE Reschedules SSC Decision

The Department of Energy has rescheduled the announcement date of its choice of a site for the Superconducting Super Collider. It was originally to be in July (amid the heat of summer and the Presidential campaign). But now it's been put off to a cooler time, "late November," according to DOE. The stated reason: "in order to benefit from public comments on the draft environmental statement being prepared for the project" and to "allow additional time for evaluation" of the seven sites still in the running.

After DOE makes its pick, the issue shifts to the White House, which remains scheduled to announce the winner in January, prior to Inauguration Day. Still missing from the SSC project is a Congressional authorization and a construction appropriation—for which the Administration is seeking $363 million next year.

. . . Inadequate Staffing Cited as Major OSTP Shortcoming

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larly when it takes a hard look at itself at the beginning of a new Administration in another year."

Hornig was followed by John P. McTague, Vice President for Research at the Ford Motor Co., a longtime staff member and Acting Director of OSTP following George A. Keyworth's resignation in 1985. McTague provided some insight on the sensitive issue of staff quality. "It is instructive to compare OSTP's staff with that of the Council of Economic Advisers," he said. "Year in and year out, the CEA attracts some of the best young academic minds to spend a few years in the EOB [Executive Office Building] providing first-rate economic analysis and policy recommendations. OSTP, on the other hand, has not tapped this resource."

At present, he continued, "there are no scientists or engineers with an academic background in OSTP, to my knowledge. With the exception of the fellows, there has also been an unfortunate lack of industrial experience in the Office."

McTague suggested a staff of 60 professionals for OSTP, adding, "The OSTP Director should not be forced into the position of begging for contributions from the various Departments and agencies."

The kindest words for Graham and the current role of OSTP came from Solomon Buchsbaum, Executive Vice President, Customer Systems, AT&T Bell Labs. Buchsbaum chairs the White House Science Council, which functions as adviser to the adviser; that's in contrast to its long-ago antecedent, the President's Science Advisory Committee (PSAC), which ostensibly worked directly for the President, until Nixon petulantly wiped it out. PSAC is glowingly remembered by the oldtimers of White House science advice, and some of them have been campaigning for its restoration.

But Buchsbaum, who served on the Nixon-era PSAC, urged caution in settling on a formula for Presidential advice. PSAC works well when it's in tune with the President, he said, "But during the years I was there, it proved largely ineffective. We enjoyed terrific prestige in the scientific and technical communities. We issued reports. But we were living an illusion, because neither the Administration nor the agencies paid much attention."

Buchsbaum continued: "The lack of rapport, as well as the lack of discipline, caused PSAC to botch the two issues that were of burning interest to the White House—namely, the ABM [anti-ballistic missile] and the SST [supersonic transport] issues. The situation is much improved today," he said, "in large part because the work of OSTP is rooted in realities."

Always hovering over the proceedings was the recognition that receptiveness to advice cannot be imposed on a President. But that hasn't restrained the science establishment or its friends in Congress. Itching to achieve a high place for science advice in the next Administration, they've recently collaborated on a process of agitation designed to get the attention of the candidates.

The annual meeting of the American Association for the Advancement of Science, last month in Boston, featured a symposium on Presidential science advice in conjunction with publication of a big collection of papers on the subject, *Science and Technology Advice to the President, Congress, and Judiciary* (523 pp., Pergamon), edited by William T. Golden, a Truman-era science adviser who was among the witnesses at the House hearing.

The Presidential candidates have been petitioned by the Federation of American Scientists to declare their position on White House Science Advice. A few (Gephardt, Gore, Simon, and Kemp) have answered, saying they're for it, but have prudently refrained from offering fine details.

To many outsiders, the campaign to bring scientific wisdom into high political circles looks like just another self-serving lobby. But, in fact, it overwhelmingly originates in desperate feelings that the US is falling short in the care, feeding, and uses of science and technology. However, as a political issue, the organization of science advice is below the threshold of notice. Though economic salvation through science and high-tech industry has entered public dialog, so far no one has struck political paydirt by working at it. The last to try was Senator John Glenn (D-Ohio), in his futile primary race in 1984 for the Democratic nomination. He spent a fortune and didn't land a single delegate.

The best that the OSTP critics can hope for at this point is that their concerns have been noted on the campaign trail and that when the winner starts putting his Administration together, he might recall hearing something about problems with science advice.—DSG

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Presidential Science Advice Scrutinized at House Hearing

Like doctors discussing the case within earshot of the sinking patient, alumni of Presidential science advice spoke discreetly last month at a rare Congressional oversight hearing on the White House Office of Science and Technology Policy (OSTP). But virtuosity in between-the-lines reading was not required to register the prevailing disquiet about the decrepit state of science in the White House.

The hearing, on Feb. 17 before a subcommittee of the House Science, Space, and Technology Committee, brought out a flock of former Presidential Science Advisers, as well as the incumbent, William R. Graham, who has held the job since October 1986. The decision to hold the hearing, described by the Committee as the first of its kind ever held in the House, arose from the widely held perception in Washington science-policy circles that the advisory system has essentially collapsed.

Graham came off as an innocent bystander, sympathized with rather than blamed. The culprit that emerged was White House indifference to sage handling of issues involving science and technology, and the hearing often shifted to discussions of how to do it better in the next Presidency.

Graham, the leadoff witness in an overflowing hearing room, took his customary Panglossian stance: "In my experience," he said, "this system works extremely well." He stressed that advisory arrangements are a Presidential prerogative, but "I would strongly recommend that any future chief executive seriously consider the current organization as one that makes full use of the talent, capabilities, and diverse views that are assembled within the leadership of the government."

The Subcommittee—Science, Research, and Technology—was gentle with Graham. Chairman Doug Walgren (D-Pa.) inquired if he has any regrets about OSTP affairs. Graham responded with a recital about "the substantial challenges before us."

Next came a panel of former Presidential science advisers, led off by Edward E. David Jr., who served under Nixon. David, a member of the current White House Science Council, noted that "It is very easy, and in some quarters fashionable, to criticize OSTP and its Director." But the real difficulty, David continued, is that OSTP suffers from "a paucity of resources." During his service with Nixon, he recalled, the science-advisory staff numbered 50 professionals, plus supporting personnel. Graham's staff consists of 20 professionals—a high proportion of them borrowed from federal agencies or on brief tours as fellows of professional societies.

What David referred to as a "ludicrously small staff" is a measure of the importance that the White House inner circle assigns to science advice. To elevate and institutionalize the function, David urged consideration of a proposal he has been pushing: establishment of a federally funded research center to provide science advice for the White House.

The next witness was Donald Hornig, of the Harvard School of Public Health, who served as Science Adviser throughout Lyndon Johnson's Administrations. Hornig testified that he's not abreast of current OSTP affairs. But, he said, members of the scientific community "are not aware of a flow of scientific and technological expertise into [OSTP] and they see little evidence that the activities of the Office have helped to shape significant programs or policies of the federal government." Hornig added, "There is little external evidence that the current President and his staff seek to involve OSTP" in policymaking. Dismissing the possibility of change in the remaining months of the Reagan Administration, Hornig said that the Subcommittee's examination of OSTP "will undoubtedly strengthen the office, particu-

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